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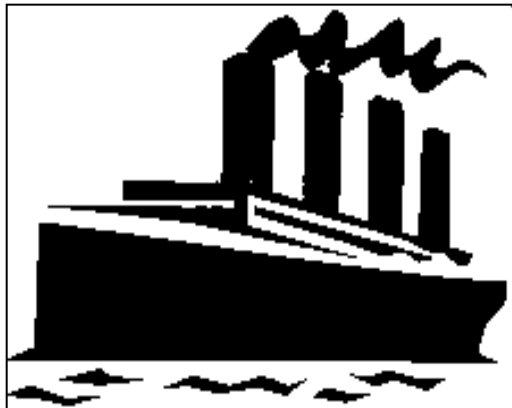
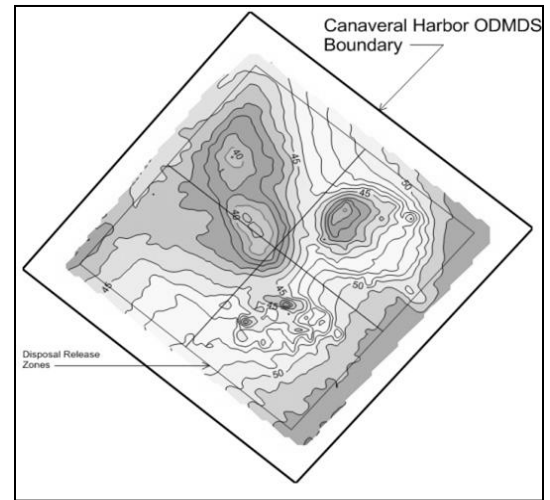
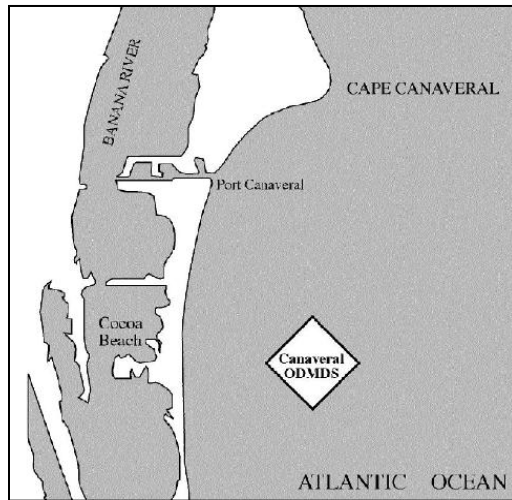


CANAVERAL HARBOR OCEAN DREDGED MATERIAL DISPOSAL SITE



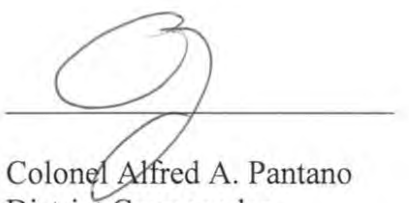
U.S. Army Corps
of Engineers

SITE MANAGEMENT AND MONITORING PLAN



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The following Site Management and Monitoring Plan for the Canaveral Harbor ODMDS has been developed and agreed to pursuant to the Water Resources Development Act Amendments of 1992 (WRDA 92) to the Marine Protection, Research, and Sanctuaries Act of 1972 for the management and monitoring of ocean disposal activities, as resources allow, by the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers.



Colonel Alfred A. Pantano
District Commander
Jacksonville District
U.S. Army Corps of Engineers
Jacksonville, Florida

4/2/29/12

Date



2/21/2012

Date

Gwendolyn Keyes Fleming
Regional Administrator
U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

This plan is effective from the date of signature for a period not to exceed 10 years. The plan shall be reviewed and revised more frequently if site use and conditions at site indicate a need for revision.

CANAVERAL HARBOR OCEAN DREDGED MATERIAL DISPOSAL SITE SITE MANAGEMENT AND MONITORING PLAN

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2012
Canaveral Harbor ODMDS
Site Management and Monitoring Plan

1.0 INTRODUCTION

It is the responsibility of the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) under the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 to manage and monitor each of the Ocean Dredged Material Disposal Sites (ODMDSs) designated by the EPA pursuant to Section 102 of MPRSA. Section 102(c)(3) of the MPRSA requires development of a Site Management and Monitoring Plan (SMMP) for each ODMDS and review and revision of the SMMP not less frequently than every 10 years. The 1996 document, *Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites* (EPA/USACE, 1996) and the EPA Region 4 and USACE South Atlantic Division Memorandum of Understanding (EPA/USACE, 2007) have been used as guidance in developing this SMMP.

A SMMP was originally developed as part of the designation process and was published in August 1990 as part of, *Final EIS Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation* (EPA, 1990). It was revised in 2001 to incorporate the provisions of the 1992 Water Resources Development Act, which requires the SMMPs to be reviewed and revised not less frequently than every ten years. This revision to the Canaveral Harbor ODMDS SMMP incorporates monitoring results since the 2001 SMMP and updates management strategies for the ODMDS based on those results. The SMMP provisions shall be requirements for all dredged material disposal activities at the site. All Section 103 (MPRSA) ocean disposal permits or contract specifications shall be conditioned as necessary to assure consistency with the SMMP.

1.1 Site Management and Monitoring Plan Team. An interagency SMMP team was established to assist EPA and USACE in developing the 2001 Canaveral Harbor ODMDS SMMP. The team consisted of the following agencies and their respective representatives:

- Jacksonville District U.S. Army Corps of Engineers
- State of Florida (Coastal Zone Management Office)
- EPA Region 4
- U.S. Navy
- Canaveral Port Authority
- National Marine Fisheries Service (NMFS)
- U.S. Coast Guard

These agencies will continue to be consulted in revisions to the Canaveral Harbor ODMDS SMMP. Other agencies such as the Bureau of Ocean Energy Management (BOEM) will be asked to participate where appropriate. The team will assist EPA and USACE on deciding on appropriate disposal practices, appropriate monitoring techniques, the level of monitoring, the significance of results and potential management options.

Specific responsibilities of EPA and the Jacksonville District Corps of Engineers are:

EPA: EPA is responsible for designating/designating MPRSA Section 102 Ocean Dredged Material Disposal Sites, for evaluating environmental effects of disposal dredged material at these sites and for reviewing and concurring on dredged material suitability determinations.

USACE: The USACE is responsible for evaluating dredged material suitability, issuing MPRSA Section 103 permits, regulating site use and developing and implementing disposal monitoring programs.

2.0 SITE MANAGEMENT

Section 228.3 of the Ocean Dumping Regulations (40 CFR 220-229) states: "Management of a site consists of regulating times, rates, and methods of disposal and quantities and types of materials disposed of; developing and maintaining effective ambient monitoring programs for the site; conducting disposal site evaluation studies; and recommending modifications in site use and/or designation."

2.1 Disposal Site Characteristics

The designation of the Canaveral Harbor ODMDS can be found in 40 CFR 228.15(h)(10). Coordinates in the CFR are provided in NAD 27. They have been converted to NAD83 in this document. The Canaveral Harbor ODMDS is a 2 nautical mile (nmi) by 2 nmi area centered at 28°18.750'N latitude and 80°30.986'W longitude (NAD 83) or state plane coordinates 1,446,630 ft N and 811,757 ft E (NAD83). The site coordinates are as follows:

	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 20.267'N	80 ° 31.170'W	1,455,819 N	810,734 E
East	28 ° 18.867'N	80 ° 29.236'W	1,447,378 N	821,139 E
South	28 ° 17.234'N	80 ° 30.870'W	1,437,446 N	812,416 E
West	28 ° 18.617'N	80 ° 32.736'W	1,445,788 N	802,376 E

The site (see Figure 1) lies in the Canaveral Bight on the shallow continental shelf, centered 4.5 nmi offshore Cocoa Beach, Florida, has a depth range of 12 meters (39 feet) to 17 meters (54 feet) and an area of 4 nmi². Physical and biological conditions at the ODMDS are described in,

Final Environmental Impact Statement Canaveral Harbor, Florida Ocean Dredged Material Disposal Site Designation (EPA, 1990).

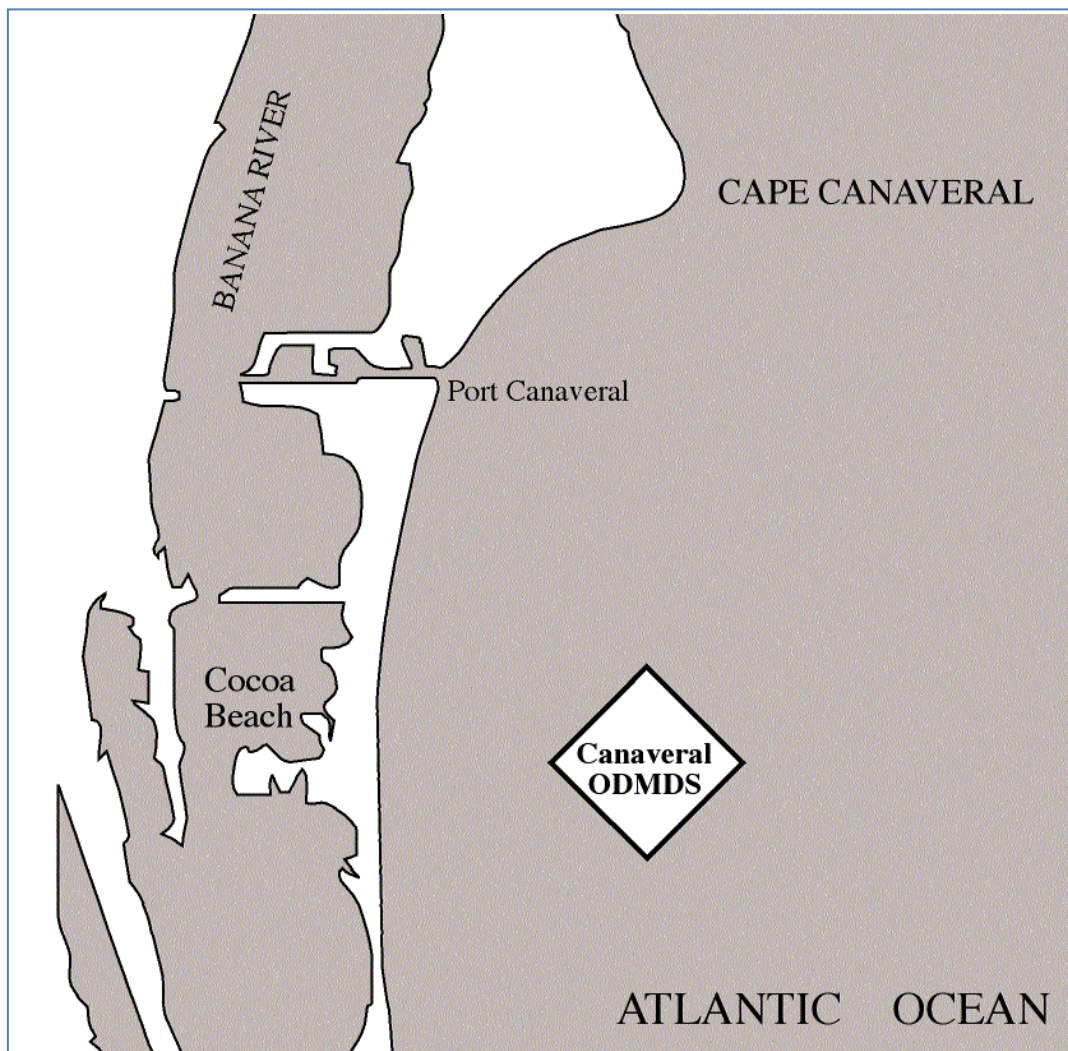


Figure 1: Canaveral Harbor ODMDS Location Map.

2.2 Management Objectives. Appropriate management of an ODMDS is aimed at assuring that disposal activities will not unreasonably degrade or endanger human health, welfare, the marine environment or economic potentialities (MPRSA §103(a)). The primary objectives in the management of the Canaveral Harbor ODMDS are:

- Protection of the marine environment;
- Documentation of disposal activities and compliance; and
- Maintenance of a long term disposal alternative for dredged material generated in the

Canaveral, Florida vicinity

The following sections provide the framework for meeting these objectives to the extent possible.

2.3 Disposal History and Dredged Material Volumes. It is intended that the Canaveral Harbor ODMDS will be used for dredged material from the greater Canaveral, Florida vicinity. The three primary users of the Canaveral Harbor ODMDS are:

- U.S. Army Corps of Engineers for Civil Works (West and Middle Turning Basins, Entrance Channel (Cut 1), Inner Channel (Cuts 2 and 3), and the Barge Canal)
- U.S. Navy (Trident Access Channel and Turning Basin, Cut 1A, Entrance Channel Widener)
- Canaveral Port Authority (West and Middle Turning Basins and Berthing Areas, Sand Trap)

Since 1974, approximately 28 million cubic yards of dredged materials have been disposed in the Canaveral Harbor ODMDS (Tables 1 and 2 and Appendix A). Since 1990 (the date of site designation), approximately 14.6 million cubic yards of dredged materials have been disposed in the Canaveral Harbor ODMDS. Between 1974 and 1990, the average annual volume of dredged material disposed in the ocean was about 943,000 cubic yards and between 1990 and 2000 the average annual disposal volume was about 847,000 cubic yards. Over the last ten years, the annual average has decreased to 550,000 cubic yards per year. The reduction in annual volumes is due to a lack of significant construction dredging projects, beneficial use of material at the nearshore site and sand tightening of the north jetty structure, which has resulted in a reduction in the amount of shoaling. Figure 2 shows the yearly record of ocean dredged material disposal in the Canaveral Harbor ODMDS for the period 1990 through 2011.

Table 1: Dredged Material Disposal Projects 2002-2011

Dates	Dredging Area	Permittee	Permit No.	Characteristics	Maintenance/ New Work	Volume Disposed Per Zone				ODMDS Total
						North	South	East	West	
8/25/02-9/14/02	CT5,CT10,NCP1-2,NCP4,SCP1-2,WTB	CPA	200005030	silt with sand	Maintenance		91,079			91,079
6/15/02-8/28/02	Cuts2b&2c,MTB-4	CW/Navy	199904378		Maintenance			665,396		665,396
6/27/03-7/23/03	WTB,MTB,TAC,CT8	CPA	200005030	silt/clay/sand	Maintenance		133,804			133,804
5/11/03-6/26/03	Cut1,WTB,WAC,Cut2b	CW/Navy	199904378	silt/clay/sand	Maintenance			526,500		526,500
6/15/04-8/1/04	Cut2,Cut1,TAC,TTB	CW/Navy	199904378	silt/clay	Maintenance			263,643		263,643
12/21/04-12/22/04	NCP3,CT8	CPA	200005030	silt/clay/sand	Maintenance		10,565			10,565
6/15/05-10/29/05	Cut2,Cut1	CW/Navy	199904378	silt/clay	Maintenance			417,995		417,995
6/20/06-11/11/06	Cuts1b&1&2&3,MTB	CW		silts/clays/sand	Maintenance			378,060		378,060
9/10/06-11/2/06	WTB,CT8,CT10,CT5,NCP1/2	CPA	200005030		Maintenance	104,471				104,471
5/1/07-7/9/07	South Jetty Sediment Trap	CPA	2005-3195		New Work		368,160			368,160
11/5/07-11/26/07	CT6/7,CT10,NCP3/4	CPA	200005030	mud		124,756				124,756
6/30/07-2/6/08	EC,TAC,TTB,MTB	CW/Navy			Maintenance			436,627		436,627
7/17/2008-10/6/08	Cuts1b&1&2,TAC,TTB,Poseidon Wharf	CW/Navy	20075637	mud,sand,clay,soft clay	Maintenance			286,230		286,230
2/11/09-2/28/09	WTB	CPA	200005030		Maintenance			92,160		92,160
2/28/09-4/4/09	ICCO	CPA	19871217		New Work		239,714			239,714
5/12/10-8/5/10	Cuts1,&2,TAC,TTB	CW/Navy	20075637	mud,clay,sand,soft-clay	Maintenance			1,170,762		1,170,762
5/14/11-6/14/11	South Jetty Sediment Trap	CPA	2005-3195	Sand,silt,clay	Maintenance	172,130				172,130
5/27/11-9/3/2011	WTB CCO Phase 2	CPA	19871217	Silt,clay,silty sand	New Work		322,580			322,580
Total						401,357	1,165,902	4,237,373	0	5,804,632

Table 2: Annual Disposal Volumes 2002-2011

Year	CPA	CW	Navy	Total
2002	91,079	624,407	40,989	756,475
2003	133,804	526,500	-	660,304
2004	10,565	238,162	25,481	274,208
2005		416,257	1,738	417,995
2006	104,471	378,060	-	482,531
2007	492,916	305,535	131,092	929,543
2008		263,683	22,547	286,230
2009	331,874	-	-	331,874
2010		1,152,022	18,740	1,170,762
2011	494,710	-	-	494,710
Total	1,659,419	3,904,626	240,587	5,804,632
Percent	29%	67%	4%	100%

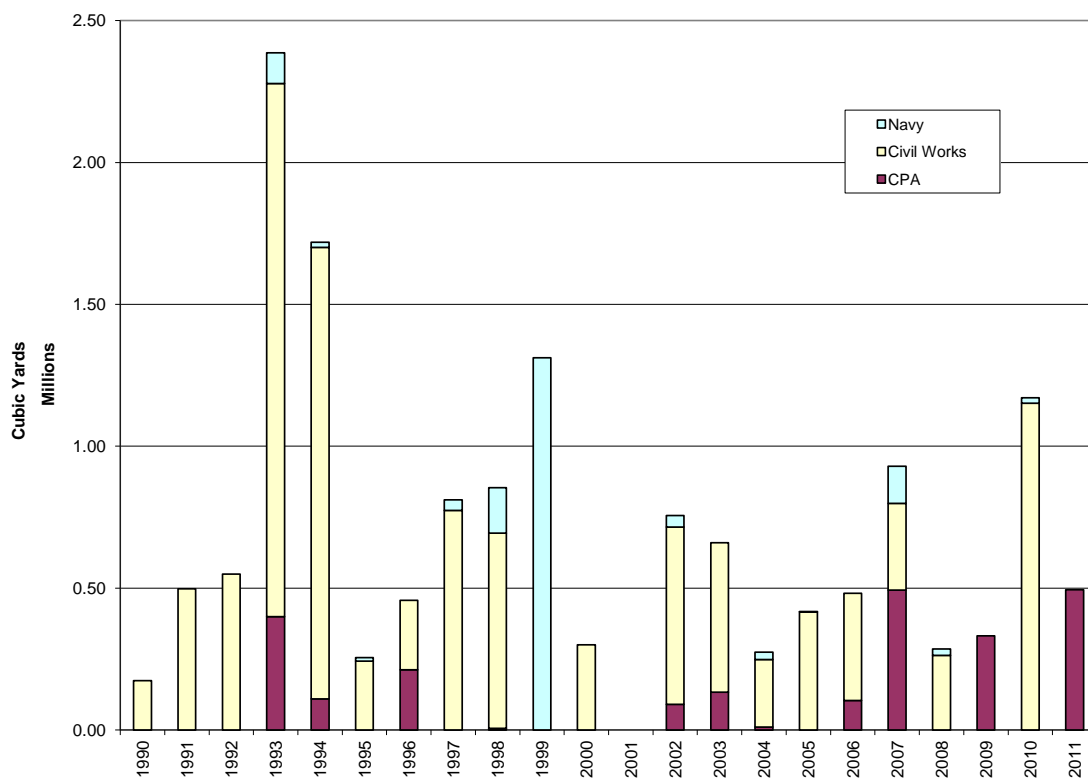


Figure 2: Volume and Sources of Dredged Material Disposed at the Canaveral Harbor ODMDS

Future volumes and rates of disposal, from both Federal and non-federal applicants, are expected to average around 900,000 cubic yards per year. Short term (10 year) projected disposal volumes are shown in Table 3 and total 9.2 million cubic yards over ten years. Civil works projects for Canaveral Harbor are anticipated to account for a majority of the total volume of material to be disposed at the ODMDS.

Table 3. Projected Volume of Dredged Material Disposed in the Canaveral Harbor ODMDS (10 year)

Year	Type of Action	Source	Volume ¹ (yd ³)	Sponsor ²	Composition
2012-2022	MD	Entrance Channel, West and Middle Turning Basins, Inner Channel and Barge Canal	364,000 per year	Civil Works	Silt and Fine Sand
2012-2022	MD	Entrance Channel Widener, Cut 1A & Trident Access Channel and Turning Basin	26,000 per year	Navy	Silt and Fine Sand
2012-2022	MD	Berthing Areas	74,000 per year	CPA	Silt and Fine Sand
2012	NW	CT5&6	178,000	CPA	Silty Sand
2012-2022	NW	Canaveral Shoals I offshore borrow area access lane	200,000	CW/KSC/PAFB/BC	Silty Sand
2012-2022	MD	S. Jetty Sed. Trap	50,000 per year	CPA	Silt and Fine Sand
2012	NW	NCB8	139,000	CPA	Silts and Sands
2012	NW	Permitted CCO Ph 2 Deepening	202,000	CPA	Silt and Fine Sand
2012	NW	NCB 5/6	36,000	CPA	Silts and Fine Sand
2013-2014	NW	NCB 8 Expansion Setback	166,000	CPA	Silt and Fine Sand
2014	NW	Deepening and Widening of the Entrance Channel and Channel to MTB	3,100,000	Civil Works	Unknown

¹*In situ*

²NW: New Work; MD: Maintenance Dredging; CPA: Canaveral Port Authority; KSC: Kennedy Space Center; PAFB: Patrick Air Force Base; BC: Brevard County

The Canaveral Harbor ODMDS has been determined to be a dispersive site (EPA, 1990). However, the dispersiveness of the site and consequently the long-term capacity of the ODMDS has yet to be determined. Site-specific field data has been collected to facilitate modeling the long-term capacity of the ODMDS (see Section 3.4.1). Capacity estimates based on the available fill volume using existing bathymetry and a maximum depth of -40 feet MLLW have been conducted for each release zone (see Table 4). Dispersion and consolidation of the disposed dredged material was not considered, nor was the need for side-slopes of the disposal mound. Therefore, use of these estimates for long range planning purposes should be cautioned. The capacity to a depth of -40 feet MLLW was estimated at 23.9 million cubic yards or 18.4 million

cubic yards *in situ* based on a bulking factor of 1.3 (Hensch, 2011).

Table 4: Capacity Estimates Based on Existing Bathymetry and a Minimum Allowable Depth of -40 feet (MLLW).

Release Zone ¹	Capacity (million cubic yards)	<i>In Situ</i> Capacity (million cubic yards)
North	3.6	2.8
East	7.6	5.9
West	4.3	3.3
South	8.2	6.3
Total	23.9	18.4

¹See Section 2.7

Until the capacity of the ODMDS has been determined utilizing USACE approved models, use of the ODMDS should not exceed half the estimated remaining site capacity (9.2 million cubic yards). This will allow sufficient time for a more detailed assessment of site capacity, implementation of management options, or environmental studies for site expansion to be conducted if necessary without adversely impacting maintenance dredging of the Port. Based on current estimates, exceedence of this volume is not anticipated. Should the approval of any project cause the exceedence of this value, an analysis of the remaining capacity of the ODMDS will have to be conducted by the USACE or permit applicant, as the case may be, prior to approval for ocean disposal of the project. The analysis should demonstrate that more than half the remaining capacity will not be consumed within the next ten years from the date of the analysis.

2.4 Dredged Material Characteristics.

2.4.1 Previously Placed Materials. Materials placed in the Canaveral Harbor ODMDS have historically consisted of silty sand, and silts and clay. Since 1992, most dredged material with less than 20 percent silt has been placed in a nearshore area rather than the ODMDS.

2.4.2. Anticipated Materials. Two basic sources of material are expected to be placed at the site; new work dredged material and maintenance material. These materials will consist of mixtures of silt, clay and sand in varying percentages. Dredged material with less than 20 percent silt is anticipated to be placed at the nearshore area rather than the ODMDS.

2.4.3 Associated Beach Quality Materials. USACE Beneficial Use of Dredged Material EM 1110-2-5026 requires dredged material be maximized within the coastal system. Dredged materials that qualify for beach or near-shore placement per the FDEP's 'Sand Rule' shall be beneficially placed in such location, to the maximum extent practicable. It is expected that the State of Florida will exercise its authority and responsibility, regarding beach nourishment, to the full extent during any future permitting activities. Beneficial use of beach compatible dredged material for beach nourishment is strongly encouraged and supported by EPA.

2.4.4 Dredge Material Quality Verification. The suitability of dredged material for ocean disposal must be verified by the USACE and agreed to via written concurrence from EPA prior to disposal. Verification will be valid for three years from the most current verification.

Verification process:

- 1) Case-specific evaluation against the exclusion criteria (40 CFR 227.13(b))
- 2) Determination of testing requirements for non-excluded material based on the potential of sediment contamination since last verification.
- 3) When applicable, execute testing and determination of suitability of non-excluded material for ocean disposal.

Verification documentation for suitability will be completed prior to use of the Canaveral Harbor ODMDS. Documentation will be in the form of a MPRSA Section 103 Evaluation. Potential testing and the Evaluation will follow the procedures outlined in the 1991 EPA/USACE Dredged Material Testing Manual and 2008 Southeast Regional Implementation Manual (SERIM) or the appropriate updated versions. This includes how dredging projects will be subdivided into project segments for sampling and analysis. The MPRSA Section 103 Evaluation will be in the form outlined in Appendix C of the SERIM. Water Quality Compliance determinations will be made using the STFATE (ADDAMS) model and the input parameters provided in Appendix B of this document. Only material determined to be suitable through the verification process by the USACE and EPA, Region 4 will be placed at the Canaveral Harbor ODMDS.

2.5 Time of disposal. At present no restrictions have been determined to be necessary for disposal related to seasonal variations in ocean current or biotic activity. As monitoring results are compiled, should any such restrictions appear necessary, disposal activities will be scheduled so as to avoid adverse impacts. During the winter, precautions necessary to protect whales, as described in Section 2.6, are required. Additionally, if new information indicates that endangered or threatened species are being adversely impacted, restrictions may be incurred.

2.6 Disposal Technique. No specific disposal technique is required for this site. However, in order to protect North Atlantic right whales, disposal vessel (either hopper dredge or tug and scow) speed and operation will be restricted in accordance with the most recent USACE South Atlantic Division Endangered Species Act Section 7 Consultation Regional Biological Opinion for Dredging of Channels and Borrow Areas in the Southeastern United States. In addition, the disposal vessel's captain should be aware of the vessel approach restrictions in 50 CFR §224.103 which at the time of this SMMP prohibits approach within 500 yards of a right whale by vessel, aircraft, or any other means.

2.7 Disposal Location. 40 CFR §227.28 requires that disposal occur no less than 330 feet (100 meters) inside the designated site boundaries. Release zones have been established to satisfy this criterion as well as manage dredged material disposal from multiple site users and multiple

projects. The release zones are described below in Table 5 and shown in Figure 3. Disposal shall be initiated within the applicable release zone boundary and completed (i.e. doors closed) prior to leaving the ODMDS boundaries. Placement methods, which prevent mounding of dredged materials from becoming an unacceptable navigation hazard, will be used. Dredged material shall be disposed so that at no point will depths less than -40 feet Mean Lower Low Water (MLLW) occur (i.e., a clearance of 40 feet above the bottom will be maintained) until further studies have been completed (see Section 2.3).

Table 5: Canaveral Harbor ODMDS Disposal Release Zones

North Zone

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 19.921'N	80 ° 31.133'W	810,940	1,453,721
East	28 ° 19.380'N	80 ° 30.386'W	814,961	1,450,458
South	28 ° 18.746'N	80 ° 31.003'W	811,666	1,446,607
West	28 ° 19.284'N	80 ° 31.738'W	807,714	1,449,851
The north zone is for disposal of material from the Canaveral Port Authority maintenance projects.				

South Zone

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 18.746'N	80 ° 31.003'W	811,666	1,446,607
East	28 ° 18.208'N	80 ° 30.269'W	815,618	1,443,364
South	28 ° 17.578'N	80 ° 30.899'W	812,525	1,439,532
West	28 ° 18.113'N	80 ° 31.620'W	808,372	1,442,757
The south zone is for disposal of material from the Canaveral Port Authority construction projects and any civil works construction projects such as the proposed port widening and deepening.				

East Zone

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 19.380'N	80 ° 30.386'W	814,961	1,450,458
East	28 ° 18.839'N	80 ° 39.638'W	818,982	1,447,196
South	28 ° 18.208'N	80 ° 30.269'W	815,618	1,443,364
West	28 ° 18.746'N	80 ° 31.003'W	811,666	1,446,607
The east zone is for disposal of material from the U.S. Navy and USACE Civil Works maintenance projects.				

West Zone

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 19.284'N	80 ° 31.738'W	807,714	1,449,851
East	28 ° 18.746'N	80 ° 31.003'W	811,666	1,446,607
South	28 ° 18.113'N	80 ° 31.620'W	808,372	1,442,757
West	28 ° 18.648'N	80 ° 32.342'W	804,488	1,445,982
The west zone is for disposal of material from the U.S. Navy and USACE Civil Works maintenance projects.				

While control of placement to minimize mounding is preferred, the physical removal or leveling of material above -30 feet MLLW is a management alternative.

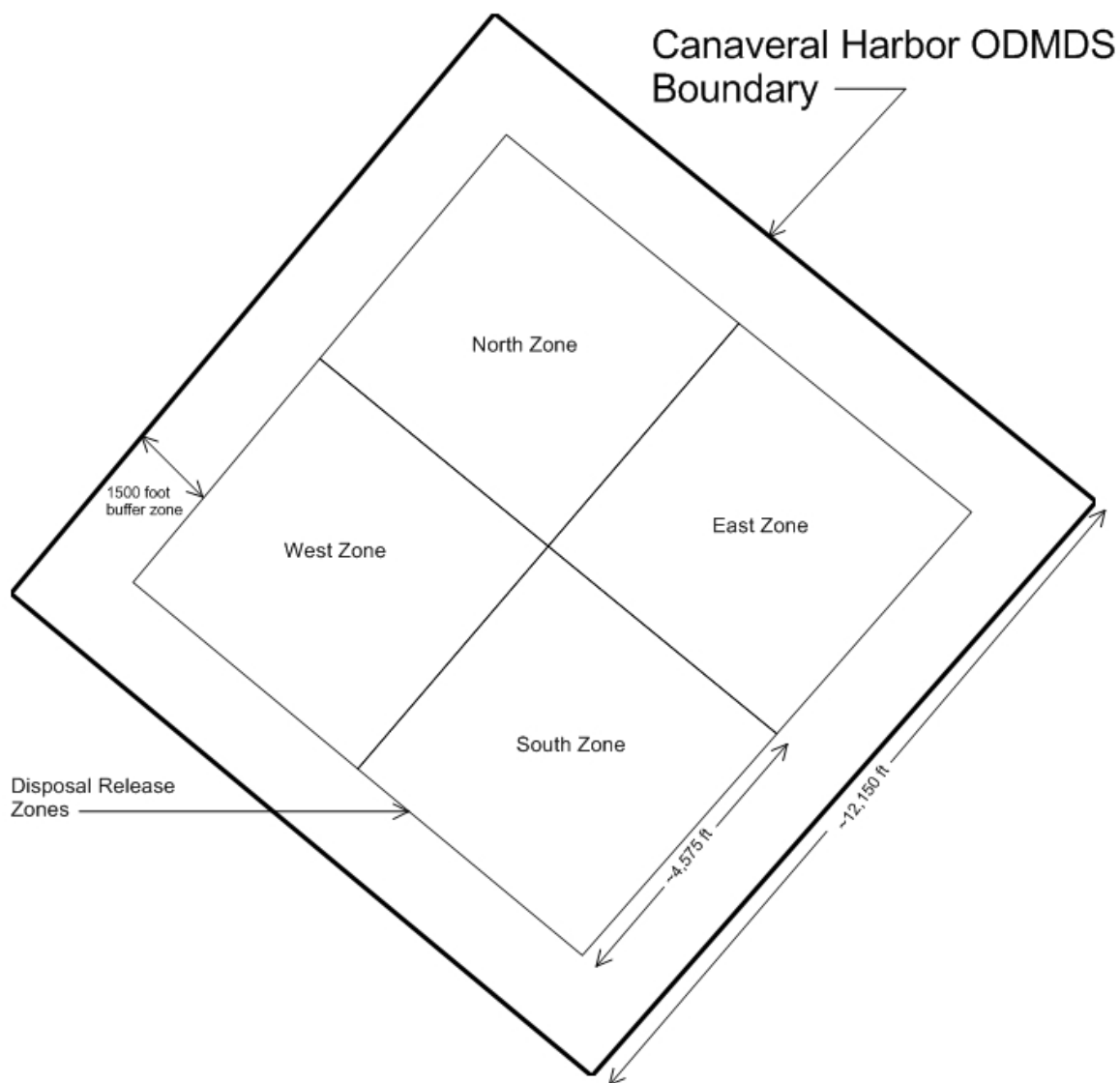


Figure 3: Canaveral Harbor ODMDS Disposal Release Zones

2.8 Permit and Contract Conditions. The disposal monitoring and post-disposal monitoring requirements described under Site Monitoring will be included as permit conditions on all MPRSA Section 103 permits and will be incorporated in the contract language for all federal projects. A summary of the management and monitoring requirements to be included are listed in Table 6. Template language that can be used is included in appendices (see Appendix C and D).

Table 6. Summary of Permit and Contract Conditions

Condition	Reference
Dredged Material Suitability and Term of Verification	Canaveral Harbor ODMDS SMMP page 9, Southeast Regional Implementation Manual
Disposal within Appropriate Zones	Canaveral Harbor ODMDS SMMP page 9-11
Northern Right Whale Avoidance	Canaveral Harbor ODMDS SMMP page 9
Post Bathymetric Surveys within 30 days of Project Completion	Canaveral Harbor ODMDS SMMP page 18
Biannual Full Site Bathymetry Surveys	Canaveral Harbor ODMDS SMMP page 22
Disposal Monitoring and Recording of Disposal Locations	Canaveral Harbor ODMDS SMMP page 18
Reporting Requirements: Disposal Summary Reports within 90 Days of Project Completion	Canaveral Harbor ODMDS SMMP page 24

2.9 Permit Process. All disposal of dredged material in the ocean, with the exception of Federal Civil Works projects, requires an ocean dumping permit issued by the USACE pursuant to Section 103 of the MPRSA. A summary of the permitting process can be found at: http://www.epa.gov/region4/water/oceans/Dredged_Material_Permit_Process.htm.

2.10 Information Management of Dredged Material Placement Activities. As discussed in the following sections, a substantial amount of diverse data regarding use of the Canaveral Harbor ODMDS and effects of disposal is required from many sources. If this information is readily available and in a useable format it can be used to answer many questions typically asked about a disposal site:

- What is being dredged?
- How much is being dredged?
- Where did the dredged material come from?
- Where was the dredged material placed?
- Was dredged material dredged and disposed correctly?
- What will happen to the environment at the disposal site?

In an attempt to streamline data sharing, EPA Region 4 and USACE South Atlantic Division have agreed on an eXtensible Markup Language (XML) standard for sharing of disposal monitoring data (see also Section 3.5). Additional standards will continue to be investigated for sharing of other disposal site related information (e.g. environmental monitoring data, testing data, etc.).

3.0 SITE MONITORING

The MPRSA establishes the need for including a monitoring program as part of the Site Management Plan. Site monitoring is conducted to ensure the environmental integrity of a disposal site and the areas surrounding the site and to verify compliance with the site designation criteria, any special management conditions, and with permit requirements. Monitoring programs should be flexible, cost effective, and based on scientifically sound procedures and methods to meet site-specific monitoring needs. The intent of the program is to provide the following:

- (1) Information indicating whether the disposal activities are occurring in compliance with the permit and site restrictions;
- (2) Information indicating the short-term and long-term fate of materials disposed of in the marine environment.
- (3) Information concerning the short-term and long-term environmental impacts of the disposal;

The main purpose of a disposal site monitoring program is to determine whether dredged material site management practices, including disposal operations, at the site need to be changed to avoid significant adverse impacts.

3.1 Baseline Monitoring. Disposal has occurred at the present site since 1974 and predates any data gathering at the site. Therefore, no true baseline information has or can be collected. The results of investigations presented in the designation EIS (See FEIS Appendices A, B, C, D, F, and G) and subsequent surveys listed in Appendix E and Table 7 will serve as the main body of data for the monitoring of the impacts associated with the use of the Canaveral Harbor ODMDS.

Table 7. Surveys and Studies Conducted at the Canaveral Harbor ODMDS (2001-present)

Survey/Study Title	Conducted By:	Date	Purpose	Results
Canaveral Harbor ODMDS Dredged Material Erosion Rate Analysis	EPA Region 4 / Sandia National Laboratories	2001	Determine erosive properties of dredged material as a function of density, consolidation and shear stress as input to long term fate models.	<ul style="list-style-type: none"> - Disposed dredged material reaches full consolidation within 2 months. - Disposed dredged material is susceptible to erosion until full consolidation. - Parameters for LTFATE model calculated
Spatial Analysis of Sediment Grain Size in the Vicinity of the Canaveral Harbor ODMDS	EPA Region 4	2003	Determine extent of physical impact due to dredged material disposal as determined by changes in grain size distribution.	-fine grain material in the vicinity of the Canaveral Harbor ODMDS does not appear to be originating from the ODMDS.
Ocean Current & Wave Measurements at the Canaveral Harbor ODMDS	EPA	2004	Determine site specific wave and current parameters for long and short term dredged material fate models.	<ul style="list-style-type: none"> -Currents are predominately northerly directed & of sufficient magnitude to initiate mound erosion 20% of the time. -Highest waves occur during late hurricane season and winter and are in excess of 3 meters. -Median wave height: 0.75 meters -Median wave period: 8.5 seconds -Wave periods are of sufficient length to influence near bottom currents.

Table 7. Surveys and Studies Conducted at the Canaveral Harbor ODMDS (2001-present)

Survey/Study Title	Conducted By:	Date	Purpose	Results
Trend Assessment Survey at the Canaveral Harbor ODMDS	EPA Region 4	2007	Periodically evaluate the impact of disposal on the marine environment (40CFR 228.9)	<ul style="list-style-type: none"> -Organic tins elevated in northern disposal zone. -No significant differences identified between biological stations inside and outside the ODMDS. -Lower number of taxa and density of organisms in active disposal zones (north & east zones).
Cape Canaveral Tributyltin Study	EPA Region 4	2010	Determine bioavailability of organic tin through measurement of pore water concentrations.	<ul style="list-style-type: none"> -Organic tins not detected in the pore water. -Organic tins no longer elevated in the sediments in north disposal zone.
Post Disposal Bathymetry Surveys	USACE, Canaveral Port Authority	Annually 2001-2011	<ul style="list-style-type: none"> - Insure safe navigation depth. - Monitor bathymetric trends. - Determine the aerial extent of the disposal mounds. 	<ul style="list-style-type: none"> - Minimum depth has increased at center of ODMDS from -30.5 feet (2000) to -39.3 feet (2010) - Mounds approaching -40 feet in north and east zones. - see Figure 4.

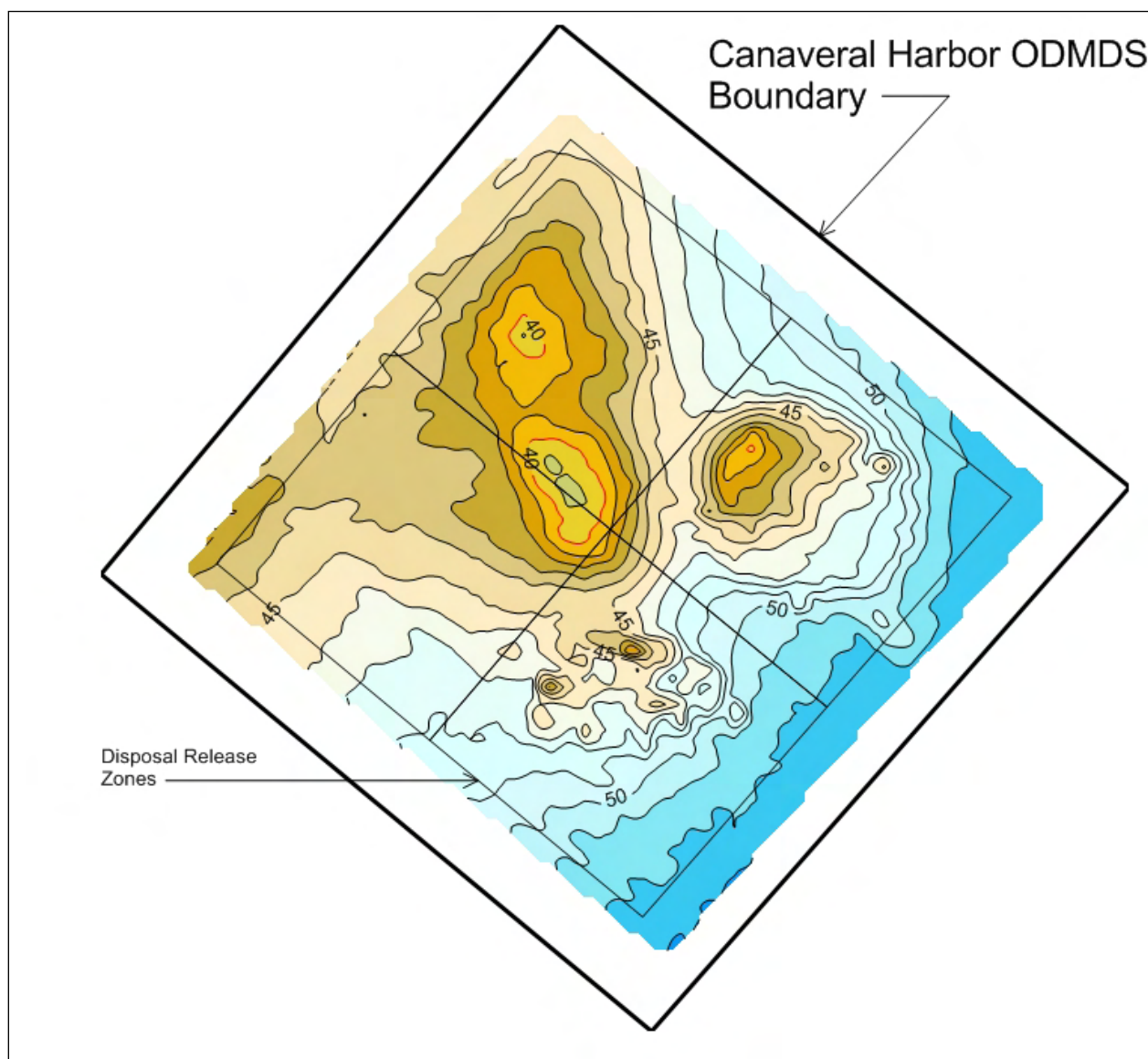


Figure 4: Canaveral Harbor ODMDS October 2010 Bathymetry

3.2 Disposal Monitoring. For all disposal activities, an electronic tracking system (ETS) must be utilized. The ETS will provide surveillance of the transportation and disposal of dredged material. The ETS will be maintained and operated to continuously track the horizontal location and draft condition (nearest 0.5 foot) of the disposal vessel (i.e. hopper dredge or disposal scow) from the point of dredging to the disposal site and return to the point of dredging. Data shall be collected at least every 500 feet during travel to and from the ODMDS and every minute or every 200 feet of travel, whichever is smaller, while approaching within 1,000 feet of the ODMDS and within the ODMDS. In addition to the continuous tracking data, the following trip

information shall be electronically recorded for each disposal cycle:

- a. Load Number
- b. Disposal Vessel Name and Type (e.g. scow)
- c. Tow Vessel Name (if applicable)
- d. Captain of Disposal or Tow Vessel
- e. Estimated volume of Load
- f. Description of Material Disposed
- g. Source of Dredged Material
- h. Date, Time and Location at Start at Initiation and Completion of Disposal Event

It is expected that disposal monitoring will be conducted utilizing the Dredge Quality Management (DQM) system for Civil Works projects [see <http://dqm.usace.army.mil/Specifications/Index.aspx>], although other systems are acceptable. Disposal monitoring and ETS data will be reported to EPA Region 4 on a weekly basis utilizing the eXtensible Markup Language (XML) specification and protocol per Section 3.5. EPA Region 4 and the USACE District shall be notified within 24 hours if disposal occurs outside of the ODMDS or specified disposal zone or if excessive leakage occurs.

3.3 Post Discharge Monitoring. The USACE or other site user will conduct a bathymetric survey within 30 days after disposal project completion. Surveys will not be required for projects less than 50,000 cubic yards. Bathymetric surveys will be used to monitor the disposal mound to insure a navigation hazard is not produced, to assist in verification of material placement, to monitor bathymetry changes and trends and to insure that the site capacity is not exceeded, i.e., the mound does not exceed the site boundaries. Surveys will conform to the minimum performance standards for Corps of Engineers Hydrographic Surveys for “Other General Surveys & Studies” as described in the USACE Engineering Manual, EM1110-2-1003, *Hydrographic Surveying* dated January 1, 2002 [<http://140.194.76.129/publications/eng-manuals/em1110-2-1003/toc.htm>]. The number and length of transects required will be sufficient to encompass the release zone utilized and a 500 foot wide area around it. The surveys will be taken along lines spaced at 500-foot intervals or less. The minimum performance standards from table 3-1 *Hydrographic Surveying* shall be followed. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing a differential global positioning system. The vertical datum will be referenced to prescribed NOAA Mean Lower Low Water (MLLW) datum. The horizontal datum should be referenced to the local State Plane Coordinate System (SPCS) for that area or in Geographical Coordinates (latitude-longitude). The horizontal reference datum should be the North American Datum of 1983 (NAD 83).

3.4 Material Tracking and Disposal Effects Monitoring. Surveys can be used to address possible changes in bathymetric, sedimentological, chemical, and biological aspects of the ODMDS and surrounding area as a result of the disposal of dredged material at the site. The 2001 Canaveral

Harbor ODMDS SMMP included a Long-Term Monitoring Strategy aimed at primarily addressing capacity and the long-term fate of dredged material disposed at the ODMDS. Most of the tasks were completed. However, the modeling to address capacity issues and the long-term fate of the material was not initiated.

3.4.1 Summary of Results of Past Monitoring Surveys

Appendix E and Table 7 lists the past surveys at the Canaveral Harbor ODMDS. In general, the surface of the site is covered by rippled very fine sand below which fine grained mud exists. The surface sands probably represent *in-situ* washing of the sediment with removal of fines from the upper surface. However, it is difficult to determine if the observed sand-over-mud stratigraphy is: 1) uniquely related to surficial washing of muddy dredged materials, 2) a natural phenomenon reflecting existing sedimentation of fines derived from coastal erosion or riverine input, 3) a result of reworking of ancient muddy sediments, or 4) a reflection of all of the above sources.

The surveys/studies listed in appendix E and table 7 have indicated that the ODMDS is a dispersive site for fine grained material and as a result dredged material may extend beyond the designated site boundaries. Indicators of dredged material (from the sediment mapping, REMOTS, sidescan sonar and bathymetric surveys) appear within the ODMDS and to the northwest. Dredged material to the northwest of the site is likely either a result of offsite transport or historic short dumping. Current measurements indicate predominate currents are to the north. Erosion of fine-grained material from the bottom appears to be taking place within the center of the disposal site and is apparently related to the presence of dredged material deposits over consolidated clays. A bathymetric survey conducted in January 2000 indicated significant mounding occurring near the center of the ODMDS. Since 2000, the mound height has decreased by nine feet as disposal has been diverted from this location. However, a mound with a relief of approximately 7 feet has developed in the northwest portion of the east release zone. See figure 4 for the most recent site bathymetry.

Erosion rate analysis has indicated that disposed dredged material is most susceptible to erosion within 60 days following disposal. Currents in the vicinity of the Canaveral Harbor ODMDS tend to the north-northeast paralleling the coast. Maximum surface currents exceeded 40 cm/sec. The median surface current was 10 cm/sec whereas the median bottom current was 6 cm/sec. The depth averaged median current was 7 cm/sec. Currents are not dominated by tides although there exists a tidal component. Velocities on the order of 16 cm/sec are needed to initiate erosion of Canaveral Harbor dredged material. Near bottom currents of this magnitude or greater occur approximately 20 percent of the time. If storms or other high current/wave events occur shortly after disposal, offsite transport of disposed dredged material is likely to occur.

A 2007 Trend Assessment Study of the Canaveral Harbor ODMDS indicated elevated organic tins in the sediments within the north release zone. Concentrations of tributyltin were as high as 57µg/kg compared to background levels of less than 0.7µg/kg. All other analytes were at

background levels. There were no significant differences identified between biological stations inside and outside the ODMDS. However, there were a lower number of taxa and density of organisms observed in the active release zones (North and East).

As a follow-up to the 2007 Trend Assessment Study, a study of the pore water concentration of organic tins was conducted in 2010. Organic tin partitioning is highly complex and the relationship between concentrations and observed effects is much stronger for pore water. Five sediment samples and five pore water samples were collected within the north release zone. Organic tins were not detected in either the pore water or sediment samples indicating that organic tin levels are no longer elevated due to degradation, dispersion or burial.

3.4.2 Future Monitoring Surveys

Based on the type and volume of material disposed and impacts of concern, various monitoring surveys can be used to examine if and the direction the disposed dredged material is moving, and what environmental effect the material is having on the site and adjacent areas.

At the current time, no nearby biological resources have been identified that are of concern for potential impact. The Canaveral Harbor ODMDS is at least one nautical mile from all known fish havens, artificial reefs, and fishing areas. The site has been identified as partially dispersive. This means that it is expected that material will be moved outside the site boundaries. It is also expected that this material will not move in distinct mounds, but instead will blend with the surrounding environment causing a progressive transition to sediments containing a higher percentage of silt and clay. Changes in sediment composition will likely alter the benthic community structure. However, based on previous benthic studies, it is unlikely that permanent or long-term adverse impacts will result due to changes in sediment composition.

Concern has been raised regarding the potential for disposed dredged material impacting offshore sand sources and the magnitude and extent of disposed dredged material dispersal outside of the ODMDS boundaries. Additionally, mounding at the site has raised capacity concerns. Future surveys as outlined in Table 8 will focus on monitoring for adverse environmental effects and determining the rate and direction of disposed dredged material dispersal and the capacity of the ODMDS. Should future disposal at the Canaveral Harbor ODMDS result in unacceptable adverse impacts, further studies may be required to determine the persistence of these impacts, the extent of the impacts within the marine system, and/or possible means of mitigation. In addition, the management plan presented may require revision based on the outcome of any monitoring program.

Table 8. Canaveral Harbor ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Trend Assessment	Water and Sediment Quality, Benthic Community Analysis (40CFR228.13)	U.S. EPA	Periodically evaluate the impact of disposal on the marine environment (40CFR 228.9)	Approximately every 10 years.	-Absence from the site of pollution sensitive biota -Progressive non-seasonal changes in water or sediment quality	Continue Monitoring	-Conduct Environmental Effects Monitoring or Advanced Environmental Effects Monitoring -Review dredged material evaluation procedures
Environmental Effects Monitoring	Chemical Monitoring	EPA/ USACE	Determine if chemical contaminants are significantly elevated ¹ within and outside of site boundaries	Implement if disposal footprint extends beyond the site boundaries or if Trend Assessment results warrant.	Contaminants are found to be elevated ¹	Discontinue monitoring.	- Institute Advanced Environmental Effects Monitoring - Implement case specific management options (ie. Remediation, limits on quantities or types of material). -Consider isolating dredged material (capping)
	Benthic Monitoring	EPA/ USACE	Determine whether there are adverse changes in the benthic populations outside of the site and evaluate recovery rates		Adverse changes observed outside of the site that may endanger the marine environment		

¹ Significantly elevated: Concentrations above the range of contaminant levels in dredged sediments that the Regional Administrator and the District Engineer found to be suitable for disposal at the ODMDS.

² Examples of sub-lethal effects include without limitation the development of lesions, tumors, development abnormality, and/or decreased fecundity.

Table 8. Canaveral Harbor ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Advanced Environmental Effects Monitoring	Tissue Chemical Analysis	EPA/ USACE	Determine if the site is a source of adverse bioaccumulation which may endanger the marine environment	Implement if Environmental Effects Monitoring warrants.	Benthic body burdens and risk assessment models indicate potential for food chain impacts.	Discontinue monitoring	-Discontinue site use - Implement case specific management options (i.e. Remediation, limits on quantities or types of material).
	Benthic Monitoring		Determine if the site is a source of adverse sub-lethal ² changes in benthic organisms which may endanger the marine environment		Sub-lethal effects are unacceptable.		
Monitor Bathymetric Trends	Bathymetry	USACE	Determine the extent of the disposal mound and major bathymetric changes	Every 2 years	Disposal mound occurs outside ODMDS boundaries	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes -Enlarge site
Insure Safe Navigation Depth	Bathymetry	Site User	Determine height of mound and any excessive mounding	Post disposal for projects greater than 50,000 cy	Mound height > -40 feet mean lower low water (MLLW)	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes
					Mound height > -30 feet MLLW	Continue Monitoring	- Physically level material

Table 8. Canaveral Harbor ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Long-term Fate	LTFATE Modeling	CPA/ USACE	Determine dispersiveness of site and potential aerial extent of impact	-As resources allow	Measurable deposition (>5cm) outside of site boundaries	-Reduce buffer size to increase capacity -Continue site use without restrictions	-Increase buffer as needed. -Restrict disposal volumes. -Create sand berms to retard dredged material transport.
	Regional Grain Size Analysis or SPI	CPA/ USACE	Determine if site use is affecting grain size outside of the ODMDS	10 years	Significant decrease in mean grain size outside of ODMDS	Continue site use without restrictions	
Site Capacity	MDFATE Modeling	CPA/ USACE	Determine capacity of the site	-As resources allow - See section 2.3	Volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate new site. -Decrease depth restriction to -30 feet.
Compliance	Disposal Site Use Records in EPA Region 4's XML format	Site User	-Insure management requirements are being met -To assist in site monitoring	Weekly during the project	Disposal records required by SMMP are not submitted or are incomplete	Continue Monitoring	-Restrict site use until requirements are met

3.5 Reporting and Data Formatting.

3.5.1 Project Initiation and Violation Reporting. The USACE or other site user shall notify EPA 15 days prior to the beginning of a dredging cycle or project disposal. The user is also required to notify the USACE and the EPA within 24 hours if a violation of the permit and/or contract conditions related to MPRSA Section 103 or SMMP requirements occur during disposal operations.

3.5.2 Disposal Monitoring Data. Disposal monitoring data shall be provided to EPA Region 4 electronically on a weekly basis. Data shall be provided per the EPA Region 4 XML format and delivered as an attachment to an email to DisposalData.R4@epa.gov. The XML format is available from EPA Region 4.

3.5.3 Post Disposal Summary Reports. A Post Disposal Summary Report shall be provided to EPA within 90 days after project completion. These reports should include: dredging project title; permit number and expiration date (if applicable); contract number; name of contractor(s) conducting the work, name and type of vessel(s) disposing material in the ODMDS; disposal timeframes for each vessel; volume disposed at the ODMDS (as paid *in situ* volume, total paid and un paid *in situ* volume, and gross volume reported by dredging contractor), number of loads to ODMDS, type of material disposed at the ODMDS; identification by load number of any misplaced material; dates of pre and post disposal bathymetric surveys of the ODMDS and a narrative discussing any violation(s) of the 103 concurrency and/or permit (if applicable). The narrative should include a description of the violation, indicate the time it occurred and when it was reported to the EPA and USACE, discuss the circumstances surrounding the violation, and identify specific measures taken to prevent reoccurrence. The Post Disposal Summary Report should be accompanied by the bathymetry survey results (plot and X,Y,Z ASCII data file), a summary scatter plot of all disposal start locations, and a summary table of the trip information required by Section 3.2 with the exception of the disposal completion data. If all data is provided in the required XML format, scatter plots and summary tables will not be necessary.

3.5.4 Environmental Monitoring. Material tracking, disposal effects monitoring, and any other data collected shall be coordinated with and be provided to SMMP team members and federal and state agencies as appropriate. Data will be provided to other interested parties requesting such data to the extent possible. Data will be provided for all surveys in a report generated by the action agency.

The report should indicate:

- 1)How the survey relates to the SMMP and previous surveys at the Canaveral Harbor ODMDS
- 2)Provide data interpretations, conclusions, and recommendations
- 3)Project the next phase of the SMMP

Monitoring results will be summarized in subsequent revisions to the SMMP.

4.0 MODIFICATION OF THE CANAVERAL HARBOR ODMDS SMMP

Should the results of the monitoring surveys or reports from other sources indicate that continued use of the ODMDS would lead to unacceptable effects as determined by EPA and USACE; the ODMDS SMMP will be modified to mitigate the adverse impacts. The SMMP will be reviewed and revised at a minimum of every ten years. The SMMP will be reviewed and updated as necessary if site use changes significantly. For example, the SMMP will be reviewed if the quantity or type of dredged material placed at the site changes significantly or if conditions at the site indicate a need for revision.

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APPENDIX A

VOLUME OF DREDGED MATERIAL DISPOSED IN THE CANAVERAL ODMDS (1974-2000)

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Volume of Dredged Material Disposed in the Canaveral ODMDS (1974-2000)

Year	Type of Action	Source	Volume (yd ³)	Sponsor	Composition
1974	NW	Entrance Channel & Trident Basin	645,198	Navy	Sandy Silt
1974	MD	Entrance Channel & Trident Basin	223,986	Navy	Sandy Silt
1975	NW	Entrance Channel & Trident Basin	2,196,470	Navy	Sandy Silt
1975	MD	Entrance Channel & Trident Basin	187,212	Navy	Silty Sand
1975	MD	Trident Basin	63,077	Navy	Sandy Silt
1976	NW	Entrance Channel	1,343,121	Civil Works	Sandy Silt
1976	MD	Entrance Channel	341,888	Civil Works	Sandy Silt
1977	MD	Entrance Channel	48,017	Civil Works	Sandy Silt
1978	MD	Entrance Channel	282,517	Civil Works	Sandy Silt
1980	MD	Entrance Channel	1,402,547	Civil Works	Sandy Silt
1981	MD	Entrance Channel	257,326	Civil Works	Sandy Silt
1983	MD	Entrance Channel	929,555	Civil Works	Sandy Silt
1985	MD	Entrance Channel	2,958,827	Civil Works	Silty Sand
1986	NW	Entrance Channel	63,370	Civil Works	Silty Sand
1986	MD	Entrance Channel	351,535	Civil Works	Silty Sand
1988	MD	Entrance Channel	442,750	Civil Works	Silty Sand
1988	MD	Entrance Channel	1,200,188	Civil Works	Silt
1989	MD	Entrance Channel	203,000	Civil Works	Silt
1990	MD	Entrance Channel	173,772	Civil Works	Silt
1991	MD	Middle Turning Basin	497,380	Civil Works	Silt
1992	MD	Entrance Channel	342,000	Civil Works	Silt
1992	MD	Middle Turning Basin	208,000	Civil Works	Silt
1993	MD	Entrance Channel	1,878,460	Civil Works	Silt
1993	MD	Trident Access Channel	108,410	Navy	Silty Sand
1993	NW	W. Turning Basin SE Corner Cutoff	400,000	CPA	Clay
1994	NW	Entrance Channel	454,000	Civil Works	Silty Sand
1994	NW	Middle Turning Basin	1,039,000	Civil Works	Silty Sand

Year	Type of Action	Source	Volume (yd ³)	Sponsor	Composition
1994	MD	Entrance Channel	98,820	Civil Works	Silt
1994	MD	Trident Access Channel	17,510	Navy	Sandy Silt
1994	MD	W. Turning Basin CT5	24,000	CPA	Sandy Clay
1994	NW	W. Turning Basin CT10	86,000	CPA	Silty Sand
1995	MD	Entrance Channel	243,180	Civil Works	Silt
1995	MD	Trident Access Channel & Turning Basin	12,090	Navy	Silt
1996	MD	Entrance Channel	245,274	Civil	Sandy Silt
1996	NW	W. Turning Basin CT8	212,000	CPA	Silty Sand
1997	MD	Entrance Channel	773,999	Civil Works	Sandy Silt
1997	MD	Trident Turning Basin	36,965	Navy	Silts & Clays
1998	MD	Entrance Channel	688,839	Civil Works	Sandy Silt
1998	MD	Entrance Channel, TTB, & Poseidon Wharf	160,044	Navy	Sandy Silts & Clays
1998	MD	W. Turning Basin CT5	5,600	CPA	Sandy Clay
1999	MD	Entrance Channel	1,312,703	Navy	Sandy Silt
2000	MD	Entrance Channel	300,320	Civil Works	Silt

NW: New Work MD: Maintenance Dredging CPA: Canaveral Port Authority

All volumes are *in situ* volumes from surveys conducted at the dredging site.

APPENDIX B

WATER COLUMN EVALUATIONS NUMERICAL MODEL (STFATE) INPUT PARAMETERS

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Water Column Evaluations
Numerical Model (STFATE) Input Parameters
Canaveral ODMDS

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	350	ft
Spacing Between Grid Points (top to bottom)	350	ft
Constant Water Depth	47	ft
Roughness Height at Bottom of Disposal Site	.005 ¹	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	3	
Ambient Density at Depth = 3 ft	1.0257	g/cc
Ambient Density at Depth = 26 ft	1.0257	g/cc
Ambient Density at Depth = 47 ft	1.0259	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Profile	2-Point at constant depth	
X-Direction Velocity = 8 feet	-0.17	ft/sec
Z-Direction Velocity = 8 feet	0.29	ft/sec
X-Direction Velocity = 38 feet	-0.17	ft/sec
Z-Direction Velocity = 38 feet	0.11	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	7,875	ft
Location of Disposal Point from Left Edge of Grid	7,875	ft
Dumping Over Depression	0	

INPUT, EXECUTION AND OUTPUT

Parameter	Value	Units
Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	1,800	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	1,800	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	13,950	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	13,950	ft
Duration of Simulation	14,400	sec
Long Term Time Step	600	sec

COEFFICIENTS

Parameter	Keyword	Value
Settling Coefficient	BETA	0.000 ¹
Apparant Mass Coefficient	CM	1.000 ¹
Drag Coefficient	CD	0.500 ¹
Form Drag for Collapsing Cloud	CDRAG	1.000 ¹
Skin Friction for Collapsing Cloud	CFRIC	0.010 ¹
Drag for an Ellipsoidal Wedge	CD3	0.100 ¹
Drag for a Plate	CD4	1.000 ¹
Friction Between Cloud and Bottom	FRICTN	0.010 ¹
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.001 ¹
Unstratified Water Vertical Diffusion Coefficient	AKYO	Pritchard Expression
Cloud/Ambient Density Gradient Ratio	GAMA	0.250 ¹
Turbulent Thermal Entrainment	ALPHAO	0.235 ¹
Entrainment in Collapse	ALPHAC	0.100 ¹
Stripping Factor	CSTRIP	0.003 ¹

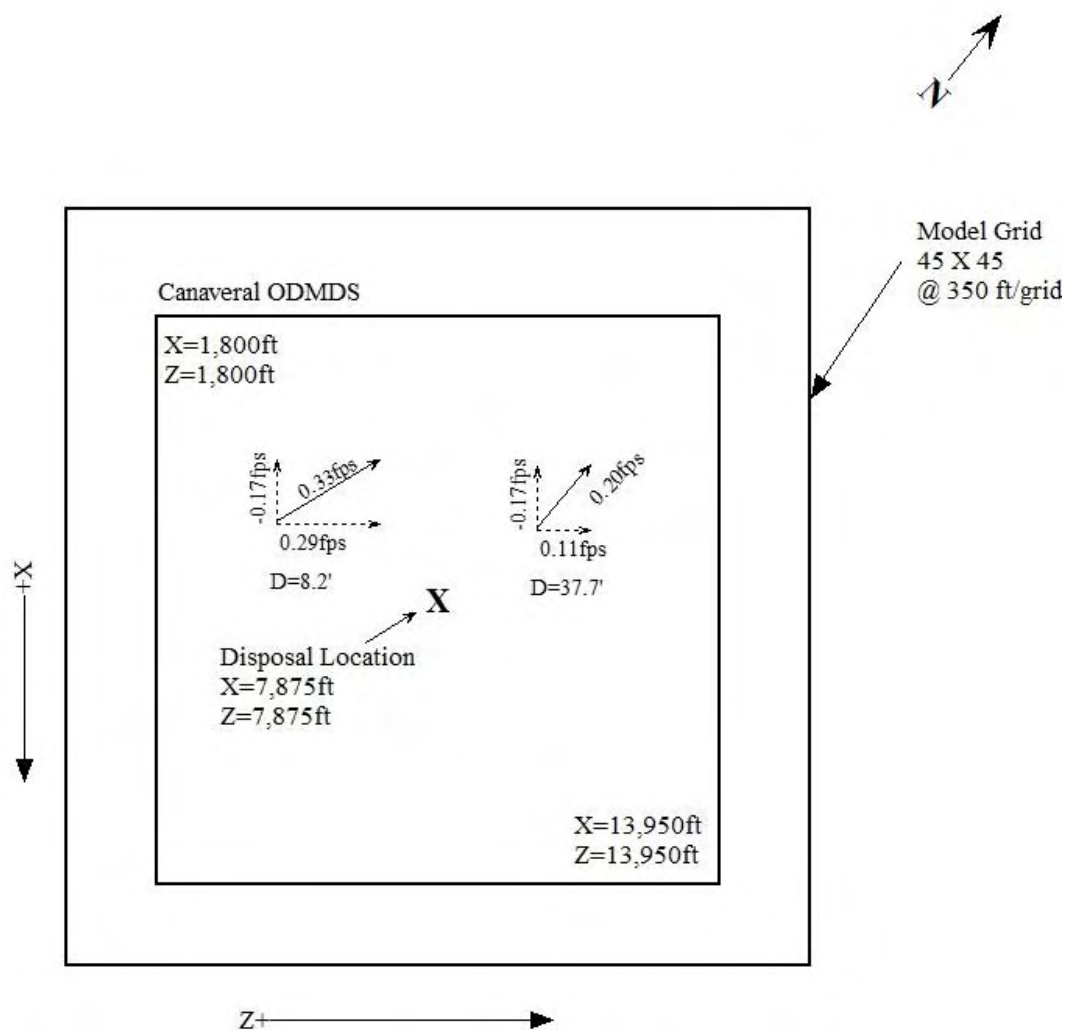
¹ Model Default Value

Expected dilution at 4 hours = 2,500:1.

Expected dilution at edge of disposal site > 60,000:1

Dilution will be dependent on the characteristics of the dredged material and the size of the disposal vessel. These values are for a very silty material with high water content and a 4,000 cubic yard scow.

Canaveral ODMDS STFATE Input Parameters



Canaveral Harbor ODMDS Background Water Concentration.	
Chemicals of Concern	Background Concentration Levels (µg/l)
Arsenic	1.36 ¹
Cadmium	0.008 ¹
Chromium (VI)	0.29 ²
Copper	0.34 ¹
Lead	0.076 ²
Mercury	0.01 ^{2,4}
Nickel	0.25 ²
Selenium	5.0 ^{1,4}
Silver	0.009 ¹
Zinc	2.33 ¹
Cyanide	0 ⁵
Tributyltin (TBT)	0.01 ^{1,4}
Aldrin	0.005 ^{1,4}
Chlordane	0.005 ^{1,4}
DDT	0.012 ^{1,4}
Dieldrin	0.005 ^{1,4}
alpha - Endosulfan	0.005 ^{1,4}
beta - Endosulfan	0.010 ^{1,4}
Endrin	0.010 ^{1,4}
gamma-BHC (Lindane)	0.002 ^{1,4}
Heptachlor	0.004 ^{1,4}
Heptachlor Epoxide	0.005 ^{1,4}
Toxaphene	0 ⁵
Pentachlorophenol	4.85 ^{1,4}

¹ 2007 EPA Status and Trends Survey at the Canaveral ODMDS

² Site Designation Studies for a New Ocean Dredged Material Disposal Site off Jacksonville, Florida: Spring and Fall 2010 Survey Results

³ Reference Station Water from the 2006 Mayport Harbor 103 Evaluation

⁴ Analyte not detected. Value based on one half the reporting limit.

⁵ Analyte detection limits are well above WQC. If analytes are detected in the dredged material elutriate, a concentration of zero will be assumed at the ODMDS.

APPENDIX C

TEMPLATE GENERIC SPECIAL CONDITIONS FOR MPRSA SECTION 103 PERMITS CANAVERAL HARBOR, FL ODMDS

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GENERIC SPECIAL CONDITIONS
FOR MPRSA SECTION 103 PERMITS

I. DISPOSAL OPERATIONS

A. For this permit, the term disposal operations shall mean: navigation of any vessel used in disposal of operations, transportation of dredged material from the dredging site to the Canaveral Harbor ODMDS, proper disposal of dredged material at the disposal area within the Canaveral Harbor ODMDS, and transportation of the hopper dredge or disposal barge or scow back to the dredging site.

B. The Canaveral Harbor ODMDS is defined as the rectangle with center coordinates of 28°18.750'N latitude and 80°30.986'W longitude (NAD 83) or state plane coordinates 1,446,630 ft N and 811,757 ft E (NAD83). The site coordinates are as follows:

	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
North	28 ° 20.267'N	80 ° 31.170'W	1,455,819 N	810,734 E
East	28 ° 18.867'N	80 ° 29.236'W	1,447,378 N	821,139 E
South	28 ° 17.234'N	80 ° 30.870'W	1,437,446 N	812,416 E
West	28 ° 18.617'N	80 ° 32.736'W	1,445,788 N	802,376 E

C. No more than [NUMBER] cubic yards of dredged material excavated at the location defined in [REFERENCE LOCATION IN PERMIT] are authorized for disposal at the Canaveral Harbor ODMDS.

D. The permittee shall use an electronic positioning system to navigate to and from the Canaveral Harbor ODMDS. For this section of the permit, the electronic positioning system is defined as: a differential global positioning system or a microwave line of site system. Use of LORAN-C alone is not an acceptable electronic positioning system for disposal operations at the Canaveral Harbor ODMDS. If the electronic positioning system fails or navigation problems are detected, all disposal operations shall cease until the failure or navigation problems are corrected.

E. The permittee shall certify the accuracy of the electronic positioning system proposed for use during disposal operations at the Canaveral Harbor ODMDS. The certification shall be accomplished by direct comparison of the electronic positioning system's accuracy with a known fixed point.

F. The permittee shall not allow any water or dredged material placed in a hopper dredge or disposal barge or scow to flow over the sides or leak from such vessels during transportation to the Canaveral Harbor ODMDS.

G. A disposal operations inspector and/or captain of any tug boat, hopper dredge or other vessel used to transport dredged material to the Canaveral Harbor ODMDS shall insure compliance with disposal operation conditions defined in this permit.

1. If the disposal operations inspector or the captain detects a violation, he shall report the violation to the permittee immediately.
2. The permittee shall contact the U.S. Army Corps of Engineers, Jacksonville District's Regulatory Division [TELEPHONE NUMBER] and EPA Region 4 at (404) 562-9391 to report the violation within twenty-four (24) hours after the violation occurs. A complete written explanation of any permit violation shall be included in the disposal summary report.

H. When dredged material is disposed, no portion of the hopper dredge or disposal barge or scow shall be outside of the boundaries of the Canaveral Harbor ODMDS as defined in Special Condition B. Additionally, disposal shall be initiated within the disposal release zone defined by the following coordinates:

[insert coordinates for appropriate release zone]

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
Center				
North				
West				
South				
East				

I. [Reserved]

J. The permittee shall use an electronic tracking system (ETS) that will continuously track the horizontal location and draft condition of the disposal vessel (hopper dredge or disposal barge or scow) to and from the Canaveral Harbor ODMDS. Data shall be collected at least every 500 feet during travel to and from the ODMDS and every minute or every 200 feet of travel, whichever is smaller, while approaching within 1,000 feet and within the ODMDS. The permittee shall use Florida State Plane or latitude and longitude coordinates (North American Datum 1983). State Plane coordinates shall be reported to the nearest foot and latitude and longitude coordinates shall be reported as decimal degrees out to 6 decimals. Westerly longitudes are to be reported as negative. Draft readings shall be recorded in feet out to 2 decimals.

K. The permittee shall record electronically for each load the following information:

- a. Load Number
- b. Disposal Vessel or Scow Name
- c. Tow Vessel Name (if scow used)
- d. Captain of Disposal or Tow Vessel

- e. Estimated volume of Load
- f. Description of Material Disposed
- g. Source of Dredged Material
- h. Date, Time and Location at Start at Initiation and Completion of Disposal Event
- i. The ETS data required by Special Condition I.J.

L. The permittee shall conduct a bathymetric survey of the Canaveral Harbor ODMDS within 30 days following project completion.

1. The number and length of the survey transects shall be sufficient to encompass the release zone specified in Special Condition H and a 500 foot wide area around the site. The transects shall be spaced at 500-foot intervals or less.

2. Vertical accuracy of the survey shall be ± 0.5 feet. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing either microwave line of site system or differential global positioning system. The vertical datum shall be mean lower low water (m.l.l.w) and the horizontal datum shall use Florida State Plane or latitude and longitude coordinates (North American Datum 1983). State Plane coordinates shall be reported to the nearest 0.10 foot and latitude and longitude coordinates shall be reported as decimal degrees to 6 decimal points.

M. Enclosed is the Regional Biological Opinion (RBO) dated [INSERT DATE], for swimming sea turtles, whales, and sturgeon. The RBO contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the RBO. Your authorization under the Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with the incidental take of the attached RBO, which terms and conditions are incorporated by reference in the permit. Failure to comply with the terms and conditions associated with the incidental take of the RBO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. However, depending on the affected species NMFS is the appropriate authority to determine compliance with the terms and conditions of its RBO and with the Endangered Species Act (ESA). For further clarification on this point, you should contact the appropriate agency. Should they determine that the conditions of the RBO have been violated; normally they will enforce the violation of the ESA, or refer the matter to the Department of Justice.

II. REPORTING REQUIREMENTS

A. All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following addresses: U.S. Army Corps of Engineers (Corps), Regulatory Division, Enforcement Section, P.O. Box 4970, Jacksonville, Florida 32232-0019 and U. S. Environmental Protection Agency (EPA) Region 4's Wetlands, Coastal and Oceans Branch, 61 Forsyth Street, Atlanta, GA 30303. The Permittee shall

reference this permit number, [INSERT PERMIT NUMBER], on all submittals.

B. At least 15 days before initiating any dredging operations authorized by this permit, the Permittee shall provide to the Corps and EPA a written notification of the date of commencement of work authorized by this permit.

C. Electronic data required by Special Conditions I.J and I.K shall be provided to EPA Region 4 on a weekly basis. Data shall be submitted as an eXtensible Markup Language (XML) document via Internet e-mail to DisposalData.R4@epa.gov. XML data file format specifications are available from EPA Region 4.

D. The permittee shall send one (1) copy of the disposal summary report to the Jacksonville District's Regulatory Division and one (1) copy of the disposal summary report to EPA Region 4 documenting compliance with all general and special conditions defined in this permit. The disposal summary report shall be sent within 90 days after completion of the disposal operations authorized by this permit. The disposal summary report shall include the following information:

1. The report shall indicate whether all general and special permit conditions were met. Any violations of the permit shall be explained in detail.
2. The disposal summary report shall include the following information: dredging project title; dates of disposal; permit number and expiration date; name of contractor(s) conducting the work, name and type of vessel(s) disposing material in the ODMDS; disposal timeframes for each vessel; volume disposed at the ODMDS (as paid *in situ* volume, total paid and un paid *in situ* volume, and gross volume reported by dredging contractor), number of loads to ODMDS, type of material disposed at the ODMDS; identification of any misplaced material (outside disposal zone or the ODMDS boundaries); dates of pre and post disposal bathymetric surveys of the ODMDS and a narrative discussing any violation(s) of the 103 permit. The disposal summary report should be accompanied by the bathymetry survey results (plot and X,Y,Z ASCII data file).

III. PERMIT LIABILITY

A. The permittee shall be responsible for ensuring compliance with all conditions of this permit.

B. The permittee and all contractors or other third parties who perform an activity authorized by this permit on behalf of the permittee shall be separately liable for a civil penalty of up to \$50,000 for each violation of any term of this permit they commit alone or in concert with the permittee or other parties. This liability shall be individual, rather than joint and several, and shall not be reduced in any fashion to reflect the liability assigned to and civil penalty assessed against the permittee or any other third party as defined in 33 U.S.C. Section 1415(a).

C. If the permittee or any contractor or other third party knowingly violates any term of this permit (either alone or in concert), the permittee, contractor or other party shall be individually liable for the criminal penalties set forth in 33 U.S.C. Section 1415(b).

APPENDIX D

TYPICAL CONTRACT LANGUAGE FOR IMPEMENTING THE CANAVERAL HARBOR ODMDS SMMP REQUIREMENTS

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TYPICAL CONTRACT LANGUAGE FOR IMPEMENTING SMMP REQUIREMENTS

3.3 DISPOSAL OF DREDGED MATERIAL

3.3.1 General

All material dredged shall be transported to and deposited in the disposal area(s) designated on the drawings. The approximate maximum and average distance to which the material will have to be transported are as follows:

Disposal Area	Maximum Distance Statute Miles	Average Distance Statute Miles
---------------	-----------------------------------	-----------------------------------

Canaveral Harbor ODMDS

[INSERT DISPOSAL AREA 2]	[XX miles]	[XX miles]
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[IF MATERIAL FROM DIFFERENT PROJECT AREAS GO TO DIFFERENT
DISOSAL AREAS, IT COULD BE SPECIFIED HERE]

3.3.2 Ocean Disposal Notification

- a. The Corps or the contractor shall notify EPA Region 4 's Wetlands, Coastal and Oceans Branch (61 Forsyth Street, Atlanta, GA 30303) at least 15 calendar days and the local Coast Guard Captain of the Port at least 5 calendar days prior to the first ocean disposal. The notification will be by certified mail with a copy to the Contracting Officer. The following information shall be included in the notification:
 - (1) Project designation; Corps of Engineers' Contracting Officer's name and contract number; and, the Contractor's name, address, and telephone number.
 - (2) Port of departure.
 - (3) Location of ocean disposal area (and disposal zone if required).
 - (4) Schedule for ocean disposal, giving date and time proposed for first ocean disposal.

3.3.3 Ocean Dredged Material Disposal Sites (ODMDS)

The material excavated shall be transported to and deposited in the Canaveral Harbor ODMDS shown on the drawings. When dredged material is disposed, no portion of the hopper dredge or disposal barge or scow shall be outside of the boundaries of the Canaveral Harbor ODMDS as shown on the drawings. Additionally, disposal shall be initiated within the disposal release zone defined by the following coordinates:
[insert coordinates for appropriate release zone]

Vertices	Geographic NAD 83		State Plane (Florida East 0901 U.S. Ft) NAD 83	
Center				
North				
West				
South				
East				

3.3.4 Logs

The Contractor shall keep a log for each load placed in the Canaveral Harbor ODMDS. The log entry for each load shall include:

- a. Load Number
- b. Disposal Vessel or Scow Name
- c. Tow Vessel Name (if scow used)
- d. Captain of Disposal or Tow Vessel
- e. Estimated volume of Load
- f. Description of Material Disposed
- g. Source of Dredged Material
- h. Date, Time and Location (coordinates) at Start of Initiation and Completion of Disposal Event

At the completion of dredging and at any time upon request, the log(s) shall be submitted in paper and electronic formats to the Contracting Officer for forwarding to the appropriate agencies.

3.3.5 Overflow, Spills and Leaks

Water and dredged materials shall not be permitted to overflow or spill out of barges, hopper dredges, or dump scows during transport to the disposal site(s). Failure to repair leaks or change the method of operation which is resulting in overflow of spillage will result in suspension of dredging operations and require prompt repair or change of operation to prevent overflow or spillage as a prerequisite to the resumption of dredging.

3.3.6 Electronic Tracking System (ETS) for Ocean Disposal Vessels

The Contractor shall furnish an ETS for surveillance of the movement and disposition of dredged material during dredging and ocean disposal. This ETS shall be established, operated and maintained by the Contractor to continuously track in real-time the horizontal location and draft condition of the disposal vessel (hopper dredge or disposal barge or scow) for the entire dredging cycle, including dredging area and disposal area. The ETS shall be capable of displaying and recording in real-time the disposal vessel's draft and location.

[USE LANGUAGE BELOW FOR NON DQM PROJECTS]

3.3.6.1 ETS Standards

The Contractor shall provide automated (computer) system and components to perform in accordance with COE EM 1110-1-2909. A copy of the EM can be downloaded from the following web site: <http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm>. Horizontal location shall have an accuracy equal to or better than a standard DGPS system, equal to or better than plus/minus 10 feet (horizontal repeatability). Vertical (draft) data shall have an accuracy of plus/minus 0.5 foot. Horizontal location and vertical data shall be collected in sets and each data set shall be referenced in real-time to date and local time (to nearest minute), and shall be referenced to the same state plane coordinate system used for the survey(s) shown in the contract plans. The ETS shall be calibrated, as required, in the presence of the Contracting Officer at the work location before disposal operations have started, and at 30-day intervals while work is in progress. The Contracting Officer shall have access to the ETS in order to observe its operation. Disposal operations will not commence until the ETS to be used by the Contractor is certified by the Contracting Officer to be operational and within acceptable accuracy. It is the Contractor's responsibility to select a system that will operate properly at the work location. The complete system shall be subject to the Contracting Officer's approval.

3.3.6.2 ETS Data Requirements and Submissions

- a. The ETS for each disposal vessel shall be in operation for all dredging and disposal activities and shall record the full round trip for each loading and disposal cycle. (NOTE: A dredging and disposal cycle constitutes the time from commencement of dredging to complete discharge of the material.) The Contracting Officer shall be notified immediately in the event of ETS failure and all dredging operations for the vessel shall cease until the ETS is fully operational. Any delays resulting from ETS failure shall be at the Contractor's expense.
- b. Data shall be collected, during the dredging and disposal cycle, every 500 feet (at least) during travel to the disposal area, and every minute or every 200 feet, whichever is smaller, while approaching within 1,000 feet and within the disposal area.
- c. Plot Reporting (2 types):
 - a. Tracking Plot - For each disposal event, data collected while the disposal vessel is in the vicinity of the disposal area shall be plotted in chart form, in 200-foot intervals, to show the track and draft of the disposal vessel approaching and traversing the disposal area. The plot shall identify the exact position at which the dump commenced. A sample Track and Draft Plot Diagram is on the web site indicated in paragraph CONSTRUCTION FORMS AND DETAILS below.
 - b. Scatter Plot - Following completion of all disposal events, a single and separate plot will be prepared to show the exact disposal locations of all

dumps. Every plotted location shall coincide with the beginning of the respective dump. Each dump shall be labeled with the corresponding Trip Number and shall be at a small but readable scale. A sample Scatter Plot Diagram is on the web site indicated in paragraph CONSTRUCTION FORMS AND DETAILS below.

- c. Summary Table – A spreadsheet which contains all of the information in the log(s) [Section 3.3.4] above shall be prepared and shall correspond to the exact dump locations represented on the Scatter Plot. A sample Summary Table spreadsheet is on the web site indicated in paragraph CONSTRUCTION FORMS AND DETAILS below.
- d. ETS data and log data required by Section 3.3.4 shall be provided to EPA Region 4 on a weekly or more frequent basis. Data shall be submitted to EPA Region 4 as an eXtensible Markup Language (XML) document via Internet e-mail to DisposalData.R4@epa.gov. XML data file format specifications are available from EPA Region 4. All digital ETS data shall be furnished to the Contracting Officer within 24 hours of collection. The digital plot files should be in an easily readable format such as Adobe Acrobat PDF file, Microstation DGN file, JPEG, BMP, TIFF, or similar. The hard copy of the ETS data and tracking plots shall be both maintained onboard the vessel and submitted to the Contracting Officer on a weekly basis.

[FOR DQM PROJECTS]

See: <http://dqm.usace.army.mil/Specifications/Index.aspx>

For scows, the monitoring profile, TDS profile or Ullage profile shall be used.

3.3.6.3 Misplaced Materials

Materials deposited outside of the disposal zone specified in 3.3.3 will be classified as misplaced material and will result in a suspension of dredging operations. Redredging of such materials will be required as a prerequisite to the resumption of dredging unless the Contracting Officer, at his discretion, determines that redredging of such material is not practical. If redredging of such material is not required then the quantity of such misplaced material shall be deducted from the Contractor's pay quantity. If the quantity for each misplaced load to be deducted cannot initially be agreed to by both the Contractor and Contracting Officer, then an average hopper/scow load quantity for the entire contract will be used in the determination. Misplaced loads may also be subject to penalty under the Marine, Protection, Research and Sanctuaries Act. Materials deposited above the maximum indicated elevation or outside of the disposal area template shown will require the redredging or removal of such materials at the Contractor's expense. In addition, the Contractor must notify the Contracting Officer and the Environmental Protection Agency Region 4 's Wetlands, Coastal and Oceans Branch (61 Forsyth Street, Atlanta, GA 30303) within 24 hours of a misplaced dump or any other violation of the Site Management and Monitoring Plan for the Canaveral Harbor ODMDS. Corrective actions must be implemented by the next dump and the Contracting Officer must be informed of actions taken.

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APPENDIX E

SURVEYS AND STUDIES CONDUCTED AT THE CANAVERAL HARBOR ODMDS 1984-2000

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Surveys and Studies Conducted at the Canaveral Harbor ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Interpretative Analysis of Surficial Sediments as an Aid in Transport Studies of Dredged Materials in Cape Canaveral, FL	U.S. COE Waterways Experiment Station	1984	Determine the direction and amount of sediment transport from a dredged material disposal site.	-No trends in sediment distribution -Sand waves indicate recent current activity capable of transporting sediment. -Detailed site-specific data are necessary in order to make conclusive statements about sediment transport off the disposal site.
Field Survey of the Canaveral Harbor ODMDS	Continental Shelf Associates for COE	1986	Video, Bathymetry, Hydrography, Water Quality, Sediment Benthic Survey, Tissue Analysis	-Baseline Survey -All data collected except could not obtain video due to poor clarity.
Sediment Mapping at Charleston, SC and Canaveral, FL	UGA Center for Applied Isotopes for EPA	1988	Characterization of bottom sediments using gamma spectrometry	-Showed possible presence of dredged material west of the site (low gamma activity). -Showed a mound of dredged material in the center of the site (low gamma activity).
Sidescan Sonar	EPA	July 1988	Clear candidate site with respect to obstructions and outcrops (live bottom)	-Areas of differing sediment character identified coincidental with low gamma activity.

Surveys and Studies Conducted at the Canaveral Harbor ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Video & Still Photography	EPA	July 1988	Visually observe the nature of the sediment exhibiting unique gamma isotope signatures as well as differing sonar returns.	<ul style="list-style-type: none"> -Could not obtain video due to poor clarity. -Photo's verified that the areas identified in sediment mapping and sidescan sonar surveys contained dredged material. -The dredged material identified to the west of the site appears to be from direct disposal and not transport.
Sediment Mapping & Rapid Surveillance of Fernandina Beach & Canaveral, FL ODMDSs	UGA Center for Applied Isotopes for EPA	April 1989	Examine areas identified in previous survey and areas to the northwest of the site boundaries	<ul style="list-style-type: none"> -Area of low gamma activity extends beyond the site boundaries to the northwest
REMOTS (Remote Ecological Monitoring of the Seafloor)	Science Applications International Corp. for EPA	1990	Delineate the areal extent of dredged material at the Canaveral ODMDS, assess the biological status of the area, & compare the mapped results of the gamma sled with those of REMOTS.	<ul style="list-style-type: none"> -Verified sediment mapping results. -Concluded site is dispersive for fines. Fines are eroded from the surface of the deposited material. -Dredged material may extend well beyond designated site boundaries. -Recommend precision bathymetric and sidescan survey and current meters and wave gauges.
Canaveral Harbor, FL ODMDS Benthic Communities Study	Battelle Ocean Sciences/Barry Vittor & Associates for	1990	Benthic community characterization	<ul style="list-style-type: none"> -Sampled 15 sites based on REMOTS data. -Species abundance very high and individual abundance moderately high.

Surveys and Studies Conducted at the Canaveral Harbor ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
	EPA			
Bathymetric Survey	COE - Jacksonville District	December 1991	Monitor bathymetry changes	-Minimum depth of 39.6 feet northwest of center of ODMDS -Depth at southern corner of ODMDS = 52.4 feet
Bathymetric Survey	COE - Jacksonville District	January 1993	Monitor bathymetry changes	-Minimum depth of 40.2 feet northwest of center of ODMDS -Depth at southern corner of ODMDS = 52.7 feet
Bathymetric Survey	COE - Jacksonville District	March 1994	Monitor bathymetry changes	-Minimum depth of 40.0 feet northwest of center of ODMDS -Depth at southern corner of ODMDS = 51.0 feet
Disposal Monitoring	Lyman Burk	October 1994	-Compliance	-Disposal occurred throughout site. -No disposal occurred outside of site.
Post Disposal Sediment Mapping at the Canaveral, FL ODMDS	UGA Center for Applied Isotopes for EPA	March 1995	Document changes in seafloor environment since 1989.	-Mound in center of site is still present. -Western & northwestern extensions of dredged material still present. -New deposit of dredged material detected just inside the eastern corner of the ODMDS. -Possible presence of dredged material still exists to west of site. This material does not match material in site or surrounding ambient material.

Surveys and Studies Conducted at the Canaveral Harbor ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Thesis: A Study of Dredged Material Dispersion on the Inner Continental Shelf, Cape Canaveral, FL	Julie Ellen Vann: Florida Institute of Technology	August 1995	Estimate potential for burial of the inner shelf sediments and benthic communities by disposed dredged material	-Dispersion of plume phase of disposal the significant factor in overall dispersion. -Erosion of bulk or solid phase is less significant. More current data is necessary to assess this phase. -Dredged material has dispersed to cover a 596 km ² area.
Disposal Monitoring	Gahagan & Bryant Assoc.	August 1995		-Disposal occurred mostly at the center of the site. -No disposal occurred outside of site.
Bathymetric Survey	COE - Jacksonville District	July 1996	Monitor bathymetry changes	-Minimum depth of 42.2 feet north corner of ODMDS -Depth at southern corner of ODMDS = 52.9 feet
Disposal Monitoring	CPA	August 1996	Compliance for CT#8 (permit #199101718)	-Disposal occurred mostly at the center of the site. -No disposal occurred outside of site.
Bathymetric Survey	COE - Jacksonville District	January 2000	Monitor bathymetry changes	-Minimum depth of 33.2 feet northwest of center of ODMDS -Depth at southern corner of ODMDS = 50.5 feet -Significant shoaling occurring
Acoustic Plume	EPA/NOAA	August	Estimate Dispersion	-Results inconclusive. Leakage plumes and

Surveys and Studies Conducted at the Canaveral Harbor ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Tracking		2000	Coefficient	barge malfunction interfered with ability to measure plumes.
Erosion Rate Study	EPA / Sandia National Laboratories	October 2000	Determine Erodibility of Dredged Material as function of bulk density and shear stress for use in long term fate models.	<ul style="list-style-type: none"> - Disposed dredged material reaches full consolidation within 2 months. - Disposed dredged material is susceptible to erosion until full consolidation. - Parameters for LTFATE model calculated
Bathymetric Survey	COE - Jacksonville District	November 2000	Monitor bathymetry changes	<ul style="list-style-type: none"> -Minimum depth of 30.5 feet northwest of center of ODMDS -Depth at southern corner of ODMDS = 52.0 feet -Significant shoaling occurring